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THESIS

**APACHE PRIME VENDOR SUPPORT (PVS): A CASE
STUDY OF IMPLEMENTING THE PVS INITIATIVE
WORLD WIDE IN SUPPORT OF THE AH-64 APACHE
HELICOPTER**

by

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September 2000

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In 1998, The AH-64 Apache sustainment was the most expensive in the Army and the sixth most expensive in DoD. Apache represented 22% of the Army Working Capital Fund expenditures and accounted for \$50-\$60 million in Army Material Command (AMC) sustainment expenditures. Because of the overwhelming sustainment costs, Apache modernization programs remain unfunded.

Between 42% and 49% of Apache sustainment costs funded AWCF and AMC overhead costs and Apache units would typically pay 45% to 50% above the actual repair parts acquisition costs. Neither the Army's wholesale supply system nor the repair parts contractors currently have any incentive to improve reliability as the wholesale supply system is supported through surcharges on the parts and the contractor makes more profit by selling the Army more parts.

Under acquisition reforms, a Prime Vendor Support (PVS) sustainment program has been proposed and evaluated. The PVS concept fixes sustainment costs per flying hour and incentivizes the contractor to improve reliability and readiness as profits are increased. PVS also has the added capability to modernize the Apache and its systems at no extra cost to the Government.

This thesis is undertaken to analyze and document the Army's PVS sustainment program and recommend its implementation.

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**APACHE PRIME VENDOR SUPPORT (PVS): A CASE STUDY OF
IMPLEMENTING THE PVS INITIATIVE WORLD WIDE IN SUPPORT OF
THE AH-64 APACHE HELICOPTER**

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Submitted in partial fulfillment of the
requirements for the degree of

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I. INTRODUCTION

Prime Vendor Support. As fielded systems age, the cost of ownership escalates. More money spent on support means less available for modernization and other high priority needs. Prime Vendor Support (PVS) leverages the best commercial logistics practices to reduce operating costs while improving readiness. It calls for the prime contractor of a weapon system to provide wholesale support to a single accountable corporate entity. This eliminates the need for government personnel and facilities to manage and store spare parts. The Army is looking at PVS for the Apache helicopter (estimated savings of \$800 per flight hour, or approximately half a billion dollars over a five year period). PVS also applies to other programs and services. [Ref. 26]

A. PURPOSE

The purpose of this thesis is to examine and analyze the capabilities and responsiveness of the PVS proposal upon the operational readiness rate of the AH-64 Apache Attack Helicopter. The goal is to evaluate the PVS proposal through sustainability aspects, system upgrade capability, and the overall life cycle cost. This research focuses on the application of PVS on two programs: Apache and the Navy's PBL (Performance Based Logistics). This analysis identifies the life-cycle cost benefits, the logistical life-cycle system impacts, contractual issues, and the lessons learned from the application of PVS to the Navy's PBL. The objective of this thesis is to determine and highlight the lessons learned so that they can be applied to future systems that pursue the adoption of a PVS system.

B. BACKGROUND

The support and modernization of legacy systems, in a time of budget reductions, is the greatest challenge facing the U.S. Army today. As the Army transitions to the 21st Century, money that was once readily available for the development of new equipment is

extremely scarce. The limited available monies are now utilized to upgrade and extend the lifecycle of older systems.

Operations and Support costs comprise up to 80% of a system's total life cycle cost. Nearly 75 % of the systems the Army will employ in 2010 are either under development or in the inventory today. Reducing Total Ownership Costs (TOC) for Army systems will generate savings that can be reinvested in support of key Force XXI Modernization objectives. [Ref. 27]

The drastic decrease in spending for the Army is reflected in the decline of funding in several areas. In 1985, during the Reagan years of the military buildup, the Army budget was \$116.028 billion (in 2001 constant dollars). The Army's projected budget for 2001 is \$70.569 billion, for a total decrease of 39.2 %. The most significant reduction was procurement funding, which dropped from \$27.794 billion to \$10.424 billion for total reduction of 62.5%. [Ref. 29]

Army aviation is one branch that is reeling from the repercussions of the funding cuts. The projected appropriations funding, for just aviation, declined from \$1.452 billion this year to \$1.323 billion in FY 2001. The Apache comprises 61.2% of the procurement funding remaining for aviation. The projected procurement funding for the Apache, in FY 2001, is \$811.1 million; which is down from last year's funding of \$857.6 million. [Ref. 29]

Further evidence of the effects felt by reductions in aviation funding was shown in a recent article in the *Army Times* concerning the reduced funding and Army plans for maintaining a viable force. The plan calls for equipping units with only 80% of the required number of aircraft. As an example, the Corps Aviation Brigade will have its Apache fleet reduced from 72 Apaches (three Apache Battalions with 24 aircraft each) to 48. This is equal to eliminating an entire Battalion from the force.

This thesis will focus only on the rotor wing assets and will not discuss the limited fixed wing assets that the Army utilizes. The projected future of Army aviation is structured around four helicopter systems. These four systems are the UH-60 Black hawk, CH-47 Chinook, AH-64 Apache and the latest system still in development, the RAH-66 Comanche. The RAH-66 Comanche is not expected to be fielded until 2006. Three systems that are in the current inventory are destined for retirement as early as the end of FY 00. The AH-1 Cobra is to be retired late FY 00 and the UH-1 Huey and the OH-58 A/C Kiowa, are to be retired by FY 2004. The OH- D (I) Warrior is the interim replacement for the Cobra, until the Comanche is fielded. In 2008, the first Comanche unit is projected for fielding, replacing the OH-58 D (I) Warrior.

The Apache is based upon 1970s technology and is expected to be a dominant battlefield force multiplier for the Army well into the 21st Century. The challenge that the Army faces is determining the best and most efficient methods of utilizing the limited funds available to maintain and upgrade existing, or 'legacy' systems, like the Apache. The Apache is one example of a system that requires a change to its current sustainment system due to cost and reliability factors.

One initiative the Army is investigating to improve the Apache logistics life-cycle cost is a Contractor Logistics Support (CLS) pilot program called the Prime Vendor Support (PVS) system.

The Apache PVS is essentially a program to consolidate responsibility for hardware performance and cost to the Original Equipment Manufacturers (OEMs), or Prime Contractors. PVS provides the United States Army and Army Aviation a logistical sustainment and modernization concept that insures reduced system cost of ownership, improves reliability, improves supportability, and meets or exceeds current readiness requirements. [Ref. 16]

PVS is a teaming arrangement between Boeing, Lockheed Martin Contractor Logistics Support, and General Electric intended to change the Army's logistics system by taking advantage of best commercial practices. These three corporations, with Boeing as the prime contractor, will assume total responsibility (nose-to-tail) for the support of the Apache.

C. RESEARCH QUESTIONS

1. Primary Research Question

How will PVS support the AH-64 Apache logistically, both now and in the future?

2. Secondary Research Question

- a. What is Prime Vendor Support (PVS)?
- b. What are the advantages and disadvantages of PVS?
- c. What is the difference between PVS and the current maintenance support system?
- d. What is the contractual structure of PVS?
- e. What are challenges to approving PVS?
- f. How will PVS affect the logistical support of the AH-64 Apache, to include upgrades and modifications to the systems?

D. SCOPE

The scope will include the following: (1) a basic overview of the PVS initiative, (2) an in-depth view of the proposals and guarantees, (3) the contract specifics, including funding, and (4) the modernization of the fleet through the PVS initiative. The thesis will

conclude with a recommendation for transitioning the current maintenance and supply system to the PVS system.

E. METHODOLOGY

The methodology utilized in this thesis research will consist of the following steps:

1. Conduct a literature search of books, magazine articles, and other library information resources.
2. Conduct personal interviews with the personnel involved with the PVS proposal, negotiations, and its implementation.
3. Personal interviews will be conducted via phone, fax, e-mail, and in person.
4. Identify the benefits and advantages to the AH-64 as well as the disadvantages.
5. Identify the challenges to the adoption of the PVS system.
6. Conduct a comparison and contrast study between the current maintenance support system and the PVS system.
7. Identify the possibility of the Army adopting a PVS similar system for other projects.

F. ORGANIZATION

Chapter II is an overview of the AH-64 Apache Helicopter, providing a description of the helicopter and its subsystems, as well as its various roles and missions. The chapter also describes the current variations in the models of the helicopter.

Chapter III is an overview of the Prime Vendor Support concept and how it pertains to the AH-64. The first question this chapter answers is why should the Army change its current sustainment and logistical system. The next section presents a detailed description of PVS, what it is and its proposed structure. The next section presents the advantages and disadvantages of the PVS system, including the guarantees of PVS as proposed by the Prime Contractor. The next section outlines the proposed contractual structure between the Government and the Prime Vendor, detailing the reasoning behind the selected contract type and how it will affect the Prime Contractor and the Government. The last item of this section presents the initiatives that PVS proposes towards the improvement and upgrade of the AH-64. The final section of the chapter presents the Navy's PBL implementation to its H-60 family of helicopters, outlining the successes and failures in both the support areas.

Chapter IV analyzes the Apache PVS proposal, including, PVS Implementation Analysis, Total Ownership Implications, Readiness Implications. In addition, an analysis of the Navy's PBL implementation is conducted with implications on Apache PVS implementation.

Chapter V is the final chapter and presents the conclusions and recommendations. The final section of the chapter presents areas of further research.

G. BENEFITS

This study will provide the Apache Program Executive Office (PEO) and Program Manager's (PM) Office with a thorough analysis of the PVS program. It will serve as information for the acceptance, modification or rejection of the PVS initiative.

II. THE AH-64 APACHE ATTACK HELICOPTER

A. INTRODUCTION

The "AH-64A Apache is widely recognized as the most advanced, combat-proven attack helicopter in the world." [Ref. 1] The AH-64A has proven its capabilities in such operations as Restore Hope, Desert Shield, and Desert Storm.

B. DESCRIPTION

The AH-64 is a dual engine, two pilot, tandem seated, multi-mission, and highly stable weapons-delivery platform. [Ref. 3] The two pilot positions are the pilot and the co-pilot/gunner. The pilot position is in the rear seat and his primary duties are to fly the aircraft and maintain obstacle avoidance. He can operate the all the weapons systems from the back seat, but cannot operate the laser range finder designator (LRFD) system. The co-pilot/gunner sits in the front seat and has complete flight control capability, but his primary mission is weapons engagement and flight navigation via the Doppler/Global Positioning System (GPS) navigation system and maps.

The Apache can carry up to sixteen laser-guided Hellfire anti-tank missiles, which are capable of destroying all known armor to a range of eight kilometers. Alternatively, it can carry seventy-six 2.75-inch folding-fin aerial rockets (FFAR) or any combination of Hellfire and FFAR on its four pylon wing mounts. The 2.75-inch rockets are effective against lightly armored vehicles and enemy troop concentrations to a range just over seven kilometers. The AH-64 also has a 30mm M230 Chain Gun automatic cannon capable of carrying 1200 rounds of ammunition. The Chain Gun is utilized for immediate suppression of lightly armored vehicles within four kilometers. A planned

upgrade to the weapons system for air-to-air combat includes the addition of the Stinger or the British Star Streak Air Defense Missile Systems.

The Apache is capable of flying and fighting in day or night and in limited adverse weather conditions. This ability to fly and fight these conditions is attributed to the Forward-Looking Infrared (FLIR) system. FLIR utilizes temperature variances, changes in heat of objects relative to the surrounding environment, to see into the night, unlike image intensification systems that require ambient light to operate effectively. Every object has a "heat signature." This heat signature is modified based upon the object's material (metal, rock, grass, wood, asphalt, etc.), the amount of heating (sunlight, internal heating from engine operation), or cooling (snow, rain, cloud cover).

The FLIR system is one part of the target and designation sight (TADS) and the pilot night vision system (PNVS) located on the "nose" of the aircraft. The TADS is the primary targeting sight system and night vision capability for the co-pilot/gunner. The PNVS is the pilots primary system for flying at night and sighting system for weapons utilization. The challenge for both pilots utilizing the FLIR, is target identification. The pilots must train to recognize the "heat signature" of a possible target to be able to identify it, first as an actual target versus an animal or rock formation, then identify it as friend or foe. The FLIR currently in operation on the Apache, is 1970's technology. The Army is attempting to determine ways of funding the integration of the newer FLIR II technology onto the Apache, providing technology critical for improved night flying capability and better target identification to prevent fratricide incidents.

The TADS not only has the FLIR capability, but it also has a "day-side" optics, using daylight optical lenses. The "day-side" has two sensors, a day vision optics (DVO)

and day television (DTV). The DVO has the advantage of "real world" color in the image for the co-pilot/gunner. The DTV has the greatest magnification of all three of the sensors (FLIR, DVO, and DTV), but the picture is in various shades of black and white. The high level of magnification is utilized for identifying, targeting, and engaging targets up to eight kilometers away. The better the capability of identifying enemy targets at greater distances, the better the chance of survivability for the crew in a combat scenario.

A common technique for the co-pilot/gunner to locate and engage targets, in the daytime, is to search the "battlefield" in FLIR to rapidly acquire the target. Next the co-pilot/gunner will switch to DTV or DVO to identify the target, then finally engage the target with the desired weapon system in DTV.

A powerful laser range finder/designator is located inside the "day-side". As the name indicates, the laser is for ranging targets, autonomous engagements, or allowing remote engagements for other aircraft. An autonomous engagement is when an aircraft puts laser energy onto a target and engages the same target. A remote engagement is when one aircraft puts laser energy on a target for another aircraft to engage.

C. THE APACHE VARIANTS

The AH-64 currently exists in two aircraft models, the AH-64A and the newer AH-64D. The AH-64D has two variants with the difference between the two variants consisting of the addition of the millimeter-wavelength radar, thereby giving it the designation of "Longbow". In the planned future Army structure, the Longbow is the only "heavy" attack helicopter.

The Apache Longbow is the world's only fourth-generation combat attack helicopter. [Ref. 8] The definition of fourth-generation is determined from the following history of

the attack helicopters: the first generation was the armed UH-1 Huey, second generation was the AH-1 Cobra, third generation is the AH-64A, and the Longbow is the fourth generation.

“The Apache Longbow is the only combat helicopter in service with the ability to rapidly detect, classify, prioritize and engage stationary or moving enemy targets at standoff ranges in near all weather environments.” [Ref. 2] The AH-64D has the same systems as the “A” model plus several upgrades. The upgrades include, and are not limited to advanced avionics suite, a millimeter-wavelength radar (or Longbow radar), and advanced Hellfire missiles. [Ref. 2] The millimeter-wavelength radar “provides the Apache with the ability to detect, classify and prioritize stationary and moving targets both on the ground and in the air.” [Ref. 3] The millimeter-wavelength radar provides a much better targeting system than the current system, which relies solely on the skills of either the co-pilot/gunner or a remotely activated laser designator. The system has the advantage of being able to more rapidly scan the “battlefield”, classify the targets, and enhance the probability of kill. Some of the Longbow Apache advantages that exceed the AH-64A are as follows [Ref. 2]:

- 400% more lethal (hitting more targets)
- 720% more survivable
- Meet a 91% readiness rate—11 percentage points higher than the requirement.

- From the operational requirements document (ORD), the Longbow has the following requirements:

- Reliability- at IOTE (Initial Operational Test and Evaluation), reliability for completing a 4.3 hour mission must be at .755; at IOTE plus 50,000 flight hours, reliability must be at .7765

- Availability- will be equal to or greater than the current AH-64A
- Maintainability- at IOTE, the maintenance ratio (MR) must be no more than 13.023:1 maintenance man hours per flight hour (MMH/FH); at IOTE plus 50,000 flight hours, the MR must be no more than 13.012:1 MMH/FH

The Army's eventual plan is for all of the older AH-64A Apaches to be retrofit at the Boeing plant at Mesa, Arizona where they will be refitted and redesignated AH-64Ds. This is a lengthy process whereby the aircraft is completely disassembled to its component parts, inspected, and then rebuilt with the "D" model upgrades.

D. THE ROLE OF THE APACHE

There are five different types of operations that the Apache Attack Helicopter Battalion (ATKHB) conducts. These missions are offense, defense, reconnaissance, security, and retrograde (see figure 2-1). The traditional mission for the Apache is the deep attack, which is a type of raid mission, under the "offense" heading.

The deep attacks are activities directed against enemy forces that currently are not engaged, but could influence division or corps close operations within the next 24 to 72 hours. The ATKHB will conduct deep operations at corps and divisional levels. Deep attacks by corps ATKHBs help the corps commander to shape the battlefield and set the terms for close operations. Deep attacks conducted by divisional ATKHBs help the division commander to shape the battlefield and are used to allow defending maneuver brigades to engage throughout its depth. Deep

operations will occur during both friendly offensive and defensive operations. [FM 1-112]

E. CHALLENGES WITH THE APACHE SYSTEMS

The Apache, as mentioned earlier, is a dominant force on the battlefield, but its maintainability and reliability degrade its overall potential. Because of the known problems in the areas of maintainability, the Government Accounting Office (GAO), in 1989, conducted an investigation to ascertain the root causes for the problems.

In April of 1990, the GAO published its investigative report on the Apache and its dismal maintenance "track" record. The Army's goal for the Apache is 70% Fully Mission Capable (FMC), 5% Partial Mission Capable (PMC), 75% for Mission Capable (MC), and no more than 25% in a non-mission-capable status (NMC).

For an aircraft to be FMC, the basic airframe (including its engines and rotors) and other mission essential equipment must be fully functional. The mission essential equipment includes the weapons systems, TADS and PNVs, the aircraft survivability equipment, the radios, and the radar altimeter. [Ref. 11]

An aircraft that is PMC may have any of the aforementioned equipment inoperative but it must still be flyable. A typical example of a PMC aircraft is one in which the TADS and/or PNVs are inoperative and the aircraft is still capable of flying daytime training missions.

An aircraft listed as NMC is unable to fly for some mechanical or material reason. There are a myriad of reasons for an aircraft to be placed in this status.

The GAO report reviewed and analyzed eleven Apache battalions, stationed in the United States and Europe. The report noted that the Apache FMC rates averaged 49%

and the PMC rate averaged 14%. [Ref. 11] These dismal percentages, when combined together, equal to a 67% MC.

“The frequent failures of key components and the resulting high demand for maintenance and parts are major contributors to the Apache’s low availability.” [Ref. 11] Some examples of components falling short of their expected failure intervals are as follows [Ref. 11]: main rotor blades expected failure interval was 1,500 hours and in reality, the interval was 164 hours; a tail rotor swashplate expected failure interval was 1,500 hours and in reality, the interval was 250 hours. There are several other components mentioned in the GAO report that demand high maintenance, but a major source of downtime on the Apache was the failure rate of the TADS and PNVs. [Ref. 11]

When the TADS and PNVs function properly, they are a major reason for the comparative advantage over other existing attack helicopters. The problem with the TADS and PNVs is that the systems are reaching wear out stages and the reliability is progressively decreasing. The technology and design/architecture of the TADS/PNVs are almost 30 years old. Currently, to combat the wear out problem, “one in every three Apache O&S dollars is spent on the TADS/PNVs.” [Stephen Kreipe, 17 May 2000]

With all of the technological upgrades and capabilities of the Longbow, the antiquated TADS and PNVs are a weak link in this complex aircraft. An indicator of how critical the systems are in flight safety can be demonstrated by the fact that over the past fourteen years, the TADS and PNVs were determined to be contributing factors in seventeen “Class A” accidents. [Ref. 13] A “Class A” is defined as a mishap involving a fatality or the destruction of property in excess of \$1,000,000.

A primary goal of the Army is to upgrade the Apache to second generation FLIR. Currently, all versions of the Apache utilize a first generation FLIR. The second generation FLIR technology exists and is part of the Army's RAH-66 Comanche helicopter program and is a Preplanned Product Improvement (P³I) for the Apache. The lack of funding is the primary reason the system was not incorporated into the Longbow from the initiation of the Longbow program. The plan for PVS to upgrade to the new technology will be discussed under PVS initiatives.

Personnel manning is another problem area for the Apache. The high turnover rate experienced in the maintenance personnel area impacts learning and understanding the systems on the Apache and proper troubleshooting techniques. To counter this effect, units around the world are relying on civilian contractors to conduct maintenance on the aircraft. Ten years ago, the contractor primarily worked on the TADS and PNVIS, the weapons systems, and limited assistance on the scheduled and non-scheduled maintenance of the helicopter. Now, the Apache units rely heavily on the civilian contractors to assist with the heavy burden of maintenance on the aircraft. These civilians are an integral part of a unit's continuity of training and expertise in the maintenance of the Apache.

F. SUMMARY

This chapter presented the Apache in its variations and roles. This chapter also outlined the challenges that are faced by the Apache community with the aircraft; its maintenance and potential upgrade requirements.

The challenges mentioned concerning the aircraft maintenance, its older systems that are wearing out, and decreased funding are the reasons why the Army is researching the feasibility of a Prime Vendor Support (PVS) System.

OPERATION	FORM	DESCRIPTION
OFFENSE	Attack	An offensive operation characterized by movement supported by fire. The purpose is to destroy, delay, disrupt, or attrit the enemy.
	-Hasty Attack	An offensive operation in which preparation is traded for speed to exploit an opportunity.
	-Deliberate Attack	An operation characterized by preplanned coordinated, employment of fires, and movement to close with and destroy the enemy.
	-Raid	An operation involving swift penetration of hostile territory to secure information, confuse the enemy, or destroy installations or forces.
	Movement to Contact	Used to develop the situation, establish, or regain contact with the enemy.
	Pursuit Exploitation	An offensive action against a retreating enemy force. The following-up of gains to take full advantage of success in battle.
DEFENSE	Mobile	Orients on the defeat or destruction of the enemy force by allowing it to advance to a point where it is exposed to a decisive attack by a striking force.
	Area	Orients on denying the enemy designated terrain. Conducted to defend specified terrain, when the enemy enjoys a mobility advantage over the defending force, when well-defined avenues of approach exist, and the defending force has sufficient combat power to cover the likely enemy avenues of approach in sector.
RECONNAISSANCE	Zone	A directed effort to obtain detailed information concerning all routes, obstacles, terrain, and enemy forces within a zone defined by boundaries.
	Area	A directed effort to obtain detailed information concerning the terrain or enemy activity within a prescribed area such as a ridgeline, woods, or other feature.
	Route	a directed effort to obtain detailed information of a specified route.
	Recon in Force	Conducted when commanders cannot obtain
SECURITY	Screen	A form of security that provides early warning.
	Cover	A form of security in which a unit is tasked to protect the main body by preventing the enemy from being able to engage main body forces with direct fire weapons.
	Area	Conducted when a force is given the mission to secure a specific area. Convoy and route security are applications of area security.
	Air Assault Security	A form of guard unique to aviation. Conducted during air assault operations to protect the assaulting force.
RETROGRADE	Delay	Mission that trades space for time while retaining flexibility and freedom of action.
	Withdrawal	A planned, voluntary disengagement that anticipates enemy interference.

Figure 2-1. Operations and their forms for the ATKHB (From Ref. 28)

III. PRIME VENDOR SUPPORT SYSTEM CONCEPT

A. INTRODUCTION

On April 15, 1997, the Army received an unsolicited proposal for a system that would leverage best commercial practices, rapid transportation, reduce inventory stock levels, guarantee uninterrupted support, and maintain a common interface with current systems without additional management stresses. After a brief review, Headquarters, Department of the Army directed that an integrated process team (IPT) study be conducted. The areas examined by the IPT included the business aspects, logistical issues, and legal issues. The IPT completed its study in late May 1997 and recommended the acceptance of the PVS and established a "road map" to accomplish the mission. A justification and approval (J & A) was submitted for approval to award a sole source contract, which was approved in October 1997. Within days of the approval of the J & A, negotiations for an Alpha contract began. Congress was notified of the decisions and findings on October 27, 1997. [Ref. 5]

B. PRIME VENDOR SUPPORT

1. Why the Need for Change?

In Section 912 of the National Defense Authorization Act for Fiscal Year 1998, Congress directed the Secretary of Defense to submit an implementation plan to streamline acquisition organizations, workforce, and infrastructure. As part of the plan, the Secretary directed each Military Department to designate at least ten significant programs for which the Program Manager (PM) will be made responsible for ensuring that the product support functions are properly carried out over its entire life cycle. The Secretary of the Army nominated and DoD accepted the Apache as one of the Army programs. Section 816 of the National Defense Authorization Act for Fiscal Year 1999 directed the Secretary of Defense to designate ten "Pilot Programs for Testing Program Manager Performance of Product Support Oversight Responsibilities for Life Cycle

Acquisition Programs.” The Apache program and specifically Apache PVS was designated as part of this requirement in February 1999. The designation was based on the recognition that the negotiated contract guaranteed significant reductions in operating and support (O&S) costs, improved parts availability, potential for improvement in aircraft readiness and provided substantial funding for reinvestment in modernization. [Ref. 22]

2. What is PVS?

The Apache PVS is essentially a program to consolidate responsibility for hardware performance and cost to the Original Equipment Manufacturers (OEMs), or Prime Contractors. PVS provides the United States Army and Army Aviation a logistical sustainment and modernization concept that insures reduced system cost of ownership, improves reliability, improves supportability, and meets or exceeds current readiness requirements. [Ref. 6]

PVS is designed to motivate the contractor to eliminate supply availability inefficiencies, which ultimately will reduce the maintenance workloads. [Ref. 18] PVS provides incentives to improve the reliability of spare parts to yield significant Operations and Support savings that can be applied toward modernization.

The Government retains airworthiness responsibility for the Apache, ensuring a continuous review of all potential flight safety issues. The safety issues will actually have two entities monitoring them, the Contractor and Army engineers. Additionally, under the PVS program, the Apache PM will retain oversight and monitoring responsibility for Modernization Through Spares (MTS).

MTS is a spares acquisition strategy applied throughout the material acquisition life cycle to reduce sustainment costs. It is based upon technology insertion and use of commercial products, processes, and practices to extend a system’s useful life. Systems are modernized by inserting current technology through spares acquisition. [Ref. 16]

3. What is the Structure of PVS?

PVS is a “Boeing, Lockheed Martin Contractor Logistics Support, and General

Electric initiative that assumes total responsibility (nose-to-tail) for the wholesale support of the Apache helicopter, and includes performance guarantees, modernizes the aircraft through spare parts, and partners with Army depots.” [Ref. 5] This grouping of the three contractors is known as Team Apache Systems (TAS). “TAS combines the aircraft systems integration of Boeing, the Apache prime contractor, with the sensor systems integration, technical expertise and field support of Lockheed Martin and General Electric, the Apache engine manufacturer.” [Ref. 4] The team will be responsible for the life-cycle costs for the entire AH-64 Apache program. “PVS combines just-in-time and just-in-case supply support to streamline inventory requirements.” [Ref. 4]

The just-in-time (JIT) approach stresses reducing and eventually eliminating excess inventory and eliminating any activities that add no value to a product or its processes. PVS provides incentives to eliminate the excess inventories located at all levels of the current maintenance chain. Inventory management will be a responsibility of TAS under PVS.

C. WHAT IS THE CONTRACTUAL STRUCTURE FOR PVS?

The contract is a performance-based effort with the TAS. It would be based upon a firm fixed price (FFP) with Economic Price Adjustments (EPA) contract for flying hours with Boeing. This means that the Army would negotiate with TAS and establish a set number of flying hours per aircraft, locking in an FFP sustainment contract cost. As an example, the Army requires fifty flying hours per aircraft, per month, at an agreed to dollar rate per hour. If the parts and maintenance system performance is equal to or above the set goals, the TAS is positively incentivized; if the system performance is below standard, then TAS loses money.

The contract is also set up for TAS to receive additional incentives for aircraft flight hour surges. The flight hour surges might be due to deployments or extended training intervals needed for deployments worldwide.

If the PVS system were approved, an initial one-year contract would be signed with four option years to follow. [Ref. 5] "Additionally, inherent equipment warranties built into PVS create strong incentives to exceed sustainment goals for new equipment design in areas such as reliability, maintainability, and testability." [Ref. 5]

D. ADVANTAGES / DISADVANTAGES POSED BY THE ADOPTION OF PVS

1. Need for Change

The first, and possibly most pervasive problem deals with high cost of the Apache logistics. There are no incentives in the system for the prime contractor to control costs and the high costs do not allow for modernization of the system. Currently, the units purchase required parts from the Government's wholesale system, and "If the parts are not reliable, the wholesale system sells the using tactical units more parts until they run out of funding." [Ref. 23] The contractor makes more money by selling parts to the Army, and because of this, they do not consider the impact of production and development decisions on operations and support (O&S) costs. The current system structure is a two-tiered or split management, between the Army Materiel Command (AMC) and the Commodity Managers for the Apache. AMC controls the logistics and parts, and is not necessarily concerned about reliability. The Commodity Managers are responsible for production, development, and reliability of the parts. The way the system is structured, the Government logistics system does not have the ability to influence the prime contractor's decisions since they are outside its responsibility. [Ref. 23] To

compound this problem, the Government does not have sufficient sustainment engineering resources to deal with reliability and obsolescence issues after initial fielding.

The high cost of not resourcing for modernization of the system is reflected in the following statement:

The Boeing Post Production Support Services (PPSS) contract has had reduced funding and the engineering support to the field has not been funded for the last two fiscal years. This is the contract that supports configuration management, technical publications, safety, and solves technical problems. It is difficult to support the Apache helicopter in a performance specification environment without these services because we do not have the people in-house to do the effort. This has resulted in the soldier operating with technical publications which need updating. [Ref. 23]

The implications of utilizing out of date publications is a serious matter. First and foremost, Army regulations require the use of current publications when conducting maintenance operations. Secondly, changes occur periodically to publications and those changes may be simple and some may be major modifications. A maintenance person conducting maintenance without the current publications may perform a procedure that is out of date or completely incorrect. The results range from a simple mistake that does not damage the aircraft to a costly mistake that ends with a loss of life. Current publications are vital for the proper maintenance of equipment.

2. PVS Guarantees

The ability of an entity making any promises or guarantees concerning the maintenance and reliability of the Apache is questionable, but TAS has made several aggressive guarantees. The performance guarantees include: a 25% reduction in spares and repair costs, a 25% reduction in inventory investment, a 20% reduction in Depot level returns, and average parts and supplies requisition fills at the unit level for routine

requests at 90% within 5 days and aircraft-on-the-ground (AOG) at 95% fill within 24-48 hours both in the United States and overseas. [Ref. 17] AOG is a higher status of requisition priority. It refers to an aircraft that is unable to fly and is awaiting a specific part. The current average time for spare parts for AOG is between two and seven days. The time for routine parts is approximately 56 days.

3. PVS Initiatives

The Apache maintenance program is an excellent example of a system that is in need of modernization and streamlining. The current year funds (FY 00), for the AH-64 program, are \$773.5 million. The Apache program is, by far, the most expensive program in the Army, and the 10th most expensive program DoD-wide [Ref. 9].

As mentioned earlier, the estimated annual costs for wholesale supply is \$400 million. "PVS will provide this scope of work with performance guarantees for approximately 16% less in the first five years, and with greater savings committed in the contract for following years." [Ref. 6] Some additional areas where PVS can provide additional benefits without added costs are as follows [Ref. 6]:

- 20% of contract funds would be dedicated to improving system reliability, or equipment modernization, by utilizing Modernization Through Spares (MTS)
- Guaranteed supply availability
- Firm-fixed-price lifetime warranty/performance guarantees
- Best manufacturing and acquisition practices
- In times of deployment, full support is guaranteed
- Part obsolescence responsibility

Equipment modernization is an important aspect of PVS.

Central to the PVS program is the systemic reinvestment of sustainment savings for equipment reliability modernization aimed at further O & S cost reduction. A "Modernization Through Spares" retrofit concept will be utilized on an accelerated schedule to introduce higher reliability components in to the fleet quickly, thereby driving sustainment costs down. TAS is required to provide all elements of the upgrade program, including training, fielding, technical publications, test equipment, and production within the contract for any changes that are necessary to meet the contract sustainment cost reductions. [Ref. 6]

The TADS and PNVs are a significant part of Apache planned equipment modernization program because of obsolescence. Replacing or upgrading to the second generation FLIR is a high priority for the PVS. This would be accomplished by one of two processes. The first process involves competitive redesign proposals by Lockheed-Martin and Raytheon, followed by the selection of the best system. The estimated savings for the new system would reduce the maintenance time required and increase the reliability by 134%. [Ref. 13] The second process is to utilize the current technology being incorporated in the development of the RAH-66 Comanche FLIR system. By allowing the contractor to redesign the components to fit the Apache, versus building a new system specifically for the Apache, manufacturing costs could conceivably be cut in half. [Ref. 13]

Another benefit to PVS is in the area of configuration management (CM). PVS puts the responsibility and authority for a significant portion of CM onto the contractor. This allows the contractor to implement engineering change proposals (ECP) and upgrades more rapidly while ensuring the Government will have a continuous flow of information concerning any and all changes. When ECPs and upgrades are implemented, they can be fielded faster and have the greatest effect at the user level. An example of the unresponsiveness of the current CM involves several ECPs that were submitted in 1992

for the TADS and PNVs; they still remain somewhere in the Government financial review cycle. [Ref.17] The reason for the enormous delay stems from limited budgets and the lengthy, sluggish prioritization process.

PVS also has a distinct advantage in the area of technical support. PVS will provide field technicians that will assist the current maintainers, ensuring sustainability of the equipment. This nearly doubles the number of personnel currently working on aircraft at the unit level. In 1996, "documented cost savings through prevention of 'No Evidence of Failure' (NEOF) maintenance actions resulted in an Army savings estimated at \$39.5 million- a better than 4.6 to 1 return on investment." [Ref. 6]

The concept of having field technicians working with the soldiers is not new. During Desert Shield and Desert Storm, AGUSTA, the civilian contractor for the Apache, had several civilian technicians deploy with the Apache units to the Southwest Asia Theater of Operation. The technicians worked side-by-side with the soldiers, lived in tents, and accompanied units into Iraq during the ground offensive. They proved to be an invaluable asset in maintaining the sensitive TADS and PNVs in the harsh desert environment.

Mr. John Lund states that there are numerous additional advantages that can be realized in the area of technical support, some examples are as follows [Ref. 6]:

- Provide weapon system flightline assistance in troubleshooting hardware problems
- Provide logistics supply support
- Assist in on-the-job training for military equipment operation and support

- Provide a continuity factor that maintains quality as soldiers are rotated in and out of units.

4. Disadvantages of PVS

There are some negative sides to the PVS initiative, which this thesis will address. The issues include the Army Working Capital Fund, Depot personnel workload, deployments, and sustainability. These issues have stalled the progress of the implementation of the PVS.

a. Army Working Capital Fund (AWCF)

There are two sides to the Apache supply system. These two sides are the “Wholesale” side and the “Retail” side. [Ref. 6] The wholesale side refers to the supply aspects at the depot level. “The total Apache wholesale support bill is estimated to be near \$400 million annually.” [Ref. 6] The retail side encompasses the first two levels, aviation unit maintenance (AVUM) and aviation intermediate level maintenance (AVIM).

“Funding for the Apache wholesale supply infrastructure, spares, repairs and parts are currently orchestrated through an Army financial system known as the Army Working Capital Fund, or AWCF.” [Ref. 6] Funds appropriated by Congress flow down through DoD and Army channels and eventually reach the Apache units who are then required to purchase the spare parts themselves. When purchases are made at the retail level by the Apache units, prices paid reflect the total costs incurred, including overhead rates of servicing organizations like DLA. “The purchases are at firm prices pre-set to support the total wholesale infrastructure up and down the chain.” [Ref. 5] As an example, “... the Apache avionics equipment net price typically paid by the Apache

units runs about 45-50% [above] the original purchase price of the part (paid by the Wholesale Supply System), regardless of the actual cost of repair.” [Ref. 5]

Losing funding, a significant amount of funding, is a serious concern for losing entities that oppose the PVS initiative. “The Army Materiel Command (AMC), the command responsible for the overall infrastructure of the service, stands to lose between \$50 million and \$60 million annually if the Army privatizes the sustainment of the Apache fleet through PVS.” [Ref. 13] The AWCF is established to procure spare parts for systems based on future needs, and the command is supported by adding its prorated overhead costs to the sale of parts.

The total AWCF fund in FY 1999 was \$2.9 billion, of that, \$543 million, or 18.5%, was revenue directly attributed to Apache parts sales. [Ref. 13] “The \$50 million to \$60 million that AMC stands to lose through Apache PVS represents the funding generated by the 22% parts sales markup.” [Ref. 13]

b. Outsourced Depot Workload

As sure as there are people who support the opportunity for change, there will always be opponents to the same idea. The same holds true for the PVS proposal as the personnel at Corpus Christi Army Depot (CCAD) oppose the PVS concept. According to Bruce Thorne, first Vice President of American Federation of Government employees Local 2142 CCAD, “We don’t care for this (PVS) at all (because) we believe it will cost us jobs.” [Ref. 14] The union believes that if Boeing is awarded the PVS contract, they will be very selective as to what role CCAD will play in the maintenance arena.

TAS and CCAD continue to try to reach a compromise, but to date, no

agreements have been reached. Mr. Gary Nenninger, the Army's Deputy Project Manager for Apache Helicopters, has stated, "This is not a privatization of Corpus Christi Army Depot in any way, shape or form." [Ref. 14] CCAD will still continue to operate and the personnel will still be required to man and operate the repair facilities, but the concern over workload remains.

It is estimated that the positions eliminated (at depot level) through implementing Apache PVS would equal only one-sixth of the FY 1999 total troop strength reductions at the Army's aviation and missile command (AMCOM), mandated through the Quadrennial Defense Review. [Ref. 13]

The PVS initiative is in compliance with the Core Logistics Requirements. Core Logistics Requirements legally mandated, by Title 10 United States Code 2466, requires the Army to contract out for no more than 50 percent of the funds made available for depot-level maintenance and repair. Title 10 USC 2464 requires DoD retain organic core depot maintenance capability to meet essential wartime surge demands (those requirements of the Joint Chiefs of Staff prescribed war scenario(s)), promote competition, and sustain institutional expertise.

One of the hurdles that the Army leaders have to clear for the PVS program to advance is the A-76 process. The A-76 process states the following:

Achieve Economy and Enhance Productivity. Competition enhances quality, economy, and productivity. Whenever commercial sector performance of a Government operated commercial activity is permissible, in accordance with this Circular and its Supplement, comparison of the cost of contracting and the cost of in-house performance shall be performed to determine who will do the work. [Ref. 15]

The Army requested a waiver for the A-76 process and expects to receive it. The waiver was prepared due to the belief that no other contractor or in-house offer

could surpass the benefits afforded by PVS or defeat PVS in a competition based upon the A-76 cost comparison procedures. [Ref. 17] "A PriceWaterhouse study concluded that PVS would cost \$4.4 billion dollars from FY 1999 to FY 2018, as opposed to a 'best case Government cost' of \$5.5 billion." [Ref. 13] The CCAD union officials stated they would oppose the waiver and actively support competition. [Ref 14]

c. Sole Source Contract

Numerous concerns arise from a sole-source contract. The first concern is that if TAS fails to meet its contractual obligations, for whatever reasons, then the Army will suffer in Apache readiness, possibly making it more vulnerable in a combat environment.

The lack of competition is the basis for most of the concerns. A sole source contract limits the Army's options and curtails competition and the associated price benefits. Competition is a great motivator for contractors to perform to military and contract standards at a competitive price. If they do not, then they could lose the contract and a competitor would receive the multi-million dollar contract from the Army.

d. Deployments and Supportability

Some military analysts have questioned the ability of the PVS program to function in time of war, away from fixed maintenance sites, improved landing strips, and existing infrastructure. [Ref. 14] Under PVS, the method of entry for the parts and supplies into the theater of operations is the same as is accomplished under the current doctrine. The parts will be shipped by either commercial/military airlift or via ocean going vessels. Once the part arrives in the theater, the part or supply is transferred to the Army for transportation to the forwardly deployed units. To support the military's plan

to be able to fight two major regional conflicts simultaneously, PVS has planned for two mobile wholesale depots, also called Special Repair Activities (SRA). [Ref. 6] The mobile depots will deploy at the same time as the combat forces, thus providing a forward advanced maintenance capability.

The most significant advantage mentioned in the literature was the reduced time for parts to arrive at the needed unit from initiation of request. Under the current system, parts could take several days or weeks to arrive. Despite these challenges, the PVS guarantees the parts will arrive within five days after the initial request. If an aircraft is grounded, the parts will arrive within 72 hours world-wide. [Ref. 14]

e. Risks with PVS

There are risks and concerns involved with the adoption of PVS which have been noted in several documents and conversations in the process of this thesis research.

Fall Back Plan if Contractor Does Not Perform

This risk must be addressed, as any other, with an alternative course of action. The concept will clearly identify "exits" at appropriate milestones. The failure of a business or a failure to perform is a heightened risk that would significantly affect a system's supportability under the Cradle to Grave concept. With the move to performance based requirements and away from Item and Process Specifications, the Government may have insufficient data in its repository for a reprocurement. The Government acquisition process must ensure that access to data is ensured, as appropriate. Furthermore, a reprocurement may come at a cost to the program and, if implemented with a new source, would most likely entail learning curve impacts to cost and readiness. The Government may not have a trained force structure to fill the void in the case of contractor default or non-performance.

Impact on Maneuver Force Structure

Expanded use of contractors will result in decreasing the sustainment greensuit footprint as contractors assume a more active role in sustaining our maneuver forces. This concept will decrease the maneuver force structure since some of these units will have to be diverted to provide security for contractors. The Army must make a conscious decision as to

whether an increased contractor role is worth the reduction in combatant force structure.

Impact on the Distribution Function

The Army has made a commitment to work toward distribution-based logistics with the Distribution Centers (DC) as its hub. The DCs accomplish this important function by synergistically integrating logistics information to provide what is required, where it is required, and when it is required. The level of contractor involvement at the various level, i.e., theater, corps, and division, must be developed in order to integrate these elements with an expanded contractor's presence.

Integration of an Expanded Contractor's Role

As this strategy matures, the Army will need to address the operational integration of an expanded contractor's presence. This strategy will have to integrate various contractor logistics systems (stovepipes) with the Standard Army Supply System into a synergistic effort to sustain the maneuver forces. For contractors to operate on the battlefield, the Army must provide links for communications, information and decision support systems, and logistics command and control systems.

Other Considerations

Organizational conflicts of interest arise when a contractor is unable to act objectively or has an unfair competitive advantage. Some present laws preclude the Government from involving the same industry participants on a recurring basis in early up front planning. These conflicts are addressed in Public Law 92-463 (Federal Advisory Committee Act of 1972 and AR 15-1). 41 USC 423 and FAR Part 3 (Procurement Integrity), and OMB Circular A-76 (Inherent Government Function). [Ref. 18]

E. PBL PROPOSAL FOR THE NAVY'S H-60 FLEET

The following information is based upon the Navy's proposal for acceptance of a Performance Based Logistics (PBL) plan for its H-60 fleet. The Navy anticipates signing a PBL contract in January 2001 (Ref. 19).

The Navy has researched methods to reduce its O&S costs and increase the readiness of its helicopter fleet, specifically targeted is the H-60 fleet (the newer CH-60S and SH-60R and maintain its legacy H-60s during their phase out). After observing the Army's PVS proposal, they decided to create a system based upon the PVS plan, called

Performance Based Logistics (PBL). There are some similarities between the PVS and PBL.

The similarities between PBL and PVS are limited to a few areas including O&S cost reduction, improvement in readiness, type of contract, and eventual single-source contractor selection. The PBL initiative has the same "bottom-line" as PVS; to reduce O&S costs and improve readiness. Both PBL and PVS will utilize an FFP type of contract based upon a cost per flight hour computation. The incentives of an FFP contract are the same; if the costs are under the projected amount, then the contractor receives this difference as incentive payment. On the other hand, any amount over the projected amount, the contractor suffers a loss in that amount.

1. PBL Policy

Where PVS begins as a "single-source" contract with TAS, the Navy will issue a request for proposal (RFP) for competitive pricing for its PBL. After a contractor is selected from the RFP, that contractor will provide all PBL support. [Ref. 19] As of the writing of this thesis, the incentive portion of the contract has not been finalized. When approved, the contract will have a five-year base period with five one-year extensions based upon the contractor's performance.

The Navy's PBL will utilize a combination of contractor support and organic resources to conduct the maintenance required. The Government will primarily provide the organizational level maintenance, or O-level, and transportation of material to units that are deployed.

The PBL is a teaming effort between the Navy, Lockheed Martin Naval Electronics & Support Systems, and the Sikorsky Aircraft Corporation. Their plan is to

make the helicopter logistics support better, faster, easier, and be able to save money.

The contractor will have the following responsibilities pertaining to the wholesale spares:

(Ref. 20)

- Procurement, repair, and support for the Navy H-60s peculiar repairable items and consumable items

- Support of the Navy peculiar support equipment
- Packaging, handling, storage, and transportation (PHS&T)
- Configuration management and reliability improvements

PBL is not a total coverage plan for all the logistical support elements. The areas that are not covered include: (Ref. 20):

- Maintenance and repair of aircraft
- Training or repair/maintenance of trainers
- Support for the engines and common avionics
- Publications
- Technical Support

One aspect that will not change is the "parts ordering" process. The Fleet will continue the same procedure that is currently in place.

2. PBL Specifics

There are six follow-on phases after PBL. These phases will be mentioned only and not expanded in this thesis. Phase II is engine Contractor Logistics Support (CLS). Phase III deals with partial CLS, the organizational (O) level and some of the intermediate (I) level is not included, and Phase III is divided into three sections. Phase IIIA is an organic/commercial partnership, depot level repair. Phase IIIB is the

contractor engineering technical support. Phase IIIC deals with publications. The publications include interactive electronic technical manuals. The final projected phase, Phase IV, deals with training and the support of the trainers. [Ref. 20]

The phased approach has several advantages over attempting to encompass the entire maintenance process as PVS. By utilizing a partnership approach, risk to the program, the Navy, and the contractor is reduced.

3. PBL Structure Classification

PBL is a phased approach recommended to be a non-ACAT program. The program does not meet the ACAT I-IV requirements. Currently, there is no ACAT IV designation, but the PBL program was initiated prior to the removal of the ACAT IV designation, therefore it is reflected in reference 20.

As PBL is not an Acquisition Program (no ACAT assigned), it will not require appropriated funds (funding from the NWCF). The phased approach will not meet the abbreviated acquisition program requirements, as outlined by SECNAVINST 5000.2B, "Implementation of Mandatory Procedures for Major and Non-Major Defense Acquisition Programs and Major and Non-Major Information Technology Programs."

- A weapon system program:

- (1) Whose cost is less than all of the following dollar thresholds: \$5 million in total RDT&E, \$15 million in procurement costs for any fiscal year, and \$30 million in total procurement costs for the life of the program (FY 1996 constant dollars),
- (2) Which does not affect the military characteristics of ships or aircraft or involve combat capability,
- (3) Which does not require an operational test and evaluation, and
- (4) Is so designated by the cognizant PEO/SYSCOM Commander/DRPM.

- An information technology program:

- (1) Whose cost is less than all of the following dollar thresholds: \$15 million in program costs for any single year and \$30 million in total program costs (FY 1996 constant dollars),

- (2) Which does not require an operational test and evaluation, and
- (3) Is so designated by ASN (RD&A) or designee, or PEO/SYSCOM Commander/DRPM. [Ref. 20]

F. SUMMARY

The goal of both PVS and PBL is an attempt to best utilize the limited resources that are available for their specific aircraft. The Apache PVS is an aggressive initiative that proposes a radical change in the funding stream. PVS gives the contactor "nose-to-tail" responsibility for the life-cycle costs of the Apache. The Navy PBL is a less aggressive initiative that attempts a "step-by-step" H-60 outsourcing program. It is a four-phase plan that will encompass the program incrementally. The "bottom-line" for both is to reduce O&S funds, improve availability, and improve reliability. The additional aspect for the Apache PVS is the desire to modernize the aircraft in conjunction with routine and corrective actions.

The Apache PVS has several external barriers that have prevented its implementation to this point. These barriers have been noted and documented in several periodicals, speeches, and publications.

IV. IMPLEMENTATION ANALYSIS

A. INTRODUCTION

This chapter analyzes the Army's proposed PVS approach for the AH-64 Apache and the Navy's proposed PBL approach for their H-60 series helicopters. It examines the two initiatives previously introduced. It focuses on the proposed implementation plans, impacts on cost, readiness implications, challenges, and expected benefits. Since neither initiative is signed, the chapter concludes with lessons learned from the planning and negotiations aspect of the programs.

B. APACHE

1. PVS

The Apache PVS appears to have numerous benefits including increased reliability, sustainability, modernization of the aircraft, logistics accountability, and cost savings. The Apache PVS is based upon an initial one-year contract with four option years to follow. This five-year plan is anticipated to result in \$500,000 in operating cost avoidance. [Ref 7] This figure is based upon the TAS projected savings of \$800 per flight hour.

a. Increased Reliability

The reliability advantage is realized through reduced funding requirements for parts or systems that are unreliable. There is a direct correlation between producing a high quality product and the contractor's profit ratio in the proposed FFP contract. It is in the contractor's best interest to perform equal to or better than the goals set by the Army as higher reliability means more contractor profit.

b. Increased Sustainability

The sustainability improvements result from the ability to maintain the aircraft, reducing the lead-time for parts world wide, and attaining the flying hour demands annually. The PVS guarantee of filling an average parts and supplies requisition at the unit level for routine requests at 90% within 5 days results in a reduction in order-ship time of 91%. The guarantee of aircraft-on-the-ground (AOG) fill at 95% within 24-48 hours is a reduction of 50%-71%. These reductions result in a significant increase in aircraft available for flying. By increasing the availability, units are ready for training or contingency missions. Pilots can maintain proficiency with perishable flying skills and maintenance personnel will be able to efficiently perform their duties, not having to wait for parts to arrive.

c. Modernization of the Apache

Incentives for Apache modernization are provided in the contract and the existing disincentives are replaced. Modernization of the Apache is a critical aspect that is vital for its future successes and viability in a combat environment. The Apache utilizes 1970's technology in some areas, especially in the targeting sensors and night vision (PNVS/TADSS) located on the front of the aircraft. The technology is already available to upgrade these systems, but not the funding. These are pre-planned product improvement initiatives (P³I) designed to be implemented when funding becomes available. TAS guarantees implementation of the upgrades with the current funding by eliminating the cost of funding the AWCF. "Sustainment cost reductions fueled by upgrades will slice current O&S costs by over 60%." [Ref. Mr. Lund] This is a significant advantage over the current sustainment system.

As PVS provides funding for current P³I initiatives, future Apache funding may be applied to incorporating new technologies. As newer technologies become available, improvements can be incorporated into the aircraft, extending Apache capabilities and the service life of the helicopter. These capabilities result in lower costs, that are realized when aircraft are upgraded versus procuring a new aircraft or trying to maintain a legacy system with old technologies.

d. Logistics Accountability

The logistics accountability improves under PVS, as there is a single source for tracking logistic trends across the Army. The ability to monitor the funding and logistics indices in the Army's current organic support system is challenging at best. The proposed PVS contract combines all of the logistics supportability elements into a performance statement of work that focuses on the total cost of supportability. The contract will do what the Army has been unable to do with its organic support system – incentivize lower cost logistical support that is linked with system performance. The FFP contract makes known the supportability costs to the Army for a certain availability percentage at a given number of flight hours. At the same time, the FFP contract masks the true costs as cost savings are contractor profits and overruns are contractor losses, but the contractor's incentives (improving reliability, maintainability, and availability) improve system performance for the Army. The Army will have the ability to have direct control of the prime contractor's performance. As noted earlier, the Army does not currently have the ability to have a direct influence on the wholesale support system or the prime contractor after production contract award.

The cost avoidance by implementing PVS is staggering. The current estimated operating cost for the AH-64 Apache is in excess of \$5,000 per each flight hour. "Prime Vendor Support could reduce the cost of operating an Apache by \$800 per flight hour. This pencils out to a five-year savings of almost a half a Billion dollars." [Ref. 7]

With no additional funding, TAS guarantees that 100% of the P³I initiatives will be implemented. The incentive for TAS is to increase the reliability of the aircraft and its systems, which results in reduced failures and improved operational availability. Army readiness is improved while the contractor is increasing his profit ratio – a "win-win" situation.

e. Primary Challenges

Shifting Apache maintenance funds from AWCF to PVS is the primary challenge. As shown, several million dollars are utilized to maintain the AWCF. The problem is how to fill the loss or spread the allocation to other projects in the absence of the Apache funding. As noted in MG Snider's article, "A AAA (Army Audit Agency) review in April 1999 concluded that while Apache did represent a substantial portion of the AWCF and some short term impacts may occur; there would not be an appreciable long-term impact to the AWCF if appropriate infrastructure adjustments are made." [Ref. 22] Currently, this still remains the most significant challenge for PVS supporters. [Ref. 12] To counter the AWCF challenge, an offer of \$50 million per year was made by PEO aviation to cover the loss of the AWCF funds resulting from the proposed PVS concept. [Ref. 21] The Assistant Secretary of the Army for Financial Management (ASA-FM) rejected this offer.

The primary problem is that the AWCF "owns" over \$1 Billion worth of Apache inventory which has to be procured (face value at new price), fixed bills not related to management of Apache sustainment mission of \$50 Million per year, and a bill of \$100 Million for the inventory on contract but not delivered. The underlying theme is that the AWCF, not the Army, owns the inventory and it has to be reimbursed. While over \$1 Billion worth of stock is decapitalized from the inventory every year to account for poor buying decisions, decapitalization was not allowed in this case because of the long term implications for other systems to leave the AWCF. OSD Comptroller has suggested a scheme, which buys the inventory from AWCF at a reduced price to recover the fixed cost and the pipeline bill. [Ref. 24]

PVS is to be funded under OMA (Operations and Maintenance, Army) funds, which is single year money, and it would be cost prohibitive for TAS to purchase the inventory, as proposed by the Army. For example, the projected value of a one year's contract is \$360 million, but the cost of AWCF Apache inventory is over \$1 billion. If TAS agreed to purchase the parts, the cost of the contract would increase exponentially to cover the cost of the inventory.

The TAS proposal for the inventory owned by the AWCF was to designate it as Government Furnished Equipment (GFE), since a majority of the parts are for the Apache and has little, if any, commercial value. This proposal has merit. By maintaining the parts, the Government can maintain competitiveness in contract negotiations. If PVS fails to perform to standard, the Government can select another contractor or attempt to do the work in-house, as it owns the inventory. "The ownership also is important leverage against future price increases." [Ref. 23]

Decapitalization of the inventory is not the right answer as it is counter to the Acquisition Reform objectives. A better reason to not decapitalize the inventory would be to maintain the parts and have a negotiations advantage or leverage against

rising prices. This leads to the PVS proposed idea of utilizing the parts as GFE. Without GFE designation of the inventory, the sticking point remains as the Government does not want to free issue the parts, and TAS does not want to purchase the entire inventory with only a one year contract guarantee.

The issue of AWCF funding remains internal to the Army. This is not a Government issue or a PVS issue; this is an Army internal issue. Is the AWCF so vital that it precludes the adoption of proposals that are projected to benefit the Army? Is the AWCF so important that it defies Congressional directives in the National Defense Authorization Act two years in a row to implement plans to streamline acquisition organizations, workforce, and infrastructure? These are the questions that need answers.

f. Risks Involved With PVS Adoption

There are risks and concerns involved with the adoption of PVS. These risks and concerns have been noted in several documents and conversations in the process of this thesis research.

Fall Back Plan if Contractor Does Not Perform. The Apache PM must have a contingency plan to conduct the sustainment mission should PVS fail to perform. This is a worst-case scenario, as it would be extremely challenging to find a contractor or maintenance entity able to perform the mission. There may not be any other contractors able to perform the mission, and the Apache units will have to attempt the mission themselves. A more likely scenario is that PVS may have difficulties in certain areas. There are myriad of contingencies that the Apache PM must consider as part of the risk management program.

Impact on Maneuver Force Structure. In a wartime environment or an area of hostilities, the Army will have to provide security for the contractor personnel in the theater of operations. To counter the threat, a significant amount of personnel will be committed to this duty and not to maintaining aircraft or conducting combat operations.

Impact on the Distribution Function. One of the guarantees of PVS is the ability to rapidly integrate into the military doctrine of readiness to sustain two major regional conflicts simultaneously. They will provide two mobile wholesale depots, or Special Repair Activities (SRAs) to support the military effort. The questions to be answered are, "How will these SRAs deploy to the theater of operation?" and "How will the contractor prepare for and conduct tactical unit interface?"

Integration of an Expanded Contractor's Role. "How will the contractor integrate into the units as they conduct operations?" is the question to be answered. The contractors have to have links for communications, information and decision support systems, and logistics command and control systems. This integration has to occur down to the individual maneuver unit level.

Other Considerations. With the implementation of the sole source contract, concerns about favoritism towards the larger corporations arise. Also, concerns about how the money is spent abound, especially when a funding change occurs, as with PVS. According to FAR Part 3 (Improper Business Practices and Personal Conflicts of Interest),

Government business shall be conducted in a manner above reproach and, except as authorized by statute or regulation, with complete impartiality and with preferential treatment for none. Transactions relating to the expenditure of public funds require the highest degree of public trust and an impeccable standard of conduct. The general rule is to

avoid strictly any conflict of interest or even the appearance of a conflict of interest in Government-contractor relationships. While many Federal laws and regulations place restrictions on the actions of Government personnel, their official conduct must, in addition, be such that they would have no reluctance to make a full public disclosure of their actions.

The benefits realized through a cost-analysis, for the Army, outweigh the concerns of limited competition. No other corporation is capable of the return-on-investment benefit that TAS can provide.

2. Total Ownership Implications

A pervasive problem is with high cost of the Apache logistics. There are no incentives in the current system for the prime contractor to control costs and the high costs do not allow for modernization of the system. The units purchase required parts from the wholesale system, and "If the parts are not reliable, the wholesale system sells them (the units) more parts until they (the units) run out of funding." [Ref. 23] With the split management system currently in place, the check-and-balance for the reliability aspect of parts and the contractor does not exist. Currently, the contractor makes money by selling parts to the units. It is not in his best interest, which is to make a profit, to improve the reliability of parts. They have no incentive to increase the reliability, in fact, may have a disincentive for doing so.

It is estimated that 100% of the P³I modernization programs could be accomplished with no increase in funding. One aspect that has not been explored is the cost to the individual units. In 1999, "42% of the units funding for parts went to infrastructure costs. If you remove the funding that they actually need locally, the percentage goes up to 49%." [Ref. 23] Almost half of the money spent does not go towards the aircraft operation and sustainment. One of the primary objectives of PVS is

to utilize this 42%-49% of currently available funds to modernize the Apache fleet and improve the service to the units.

With PVS, one contractor is responsible, and redundancy is reduced, which would make even more funding available for modernization. As is noted, the overhead charge from the AWCF is a huge burden upon the Apache parts system. Because of the high costs of the system overhead, units actively seek alternative measures to accomplish the mission and save scarce funding. This desire to seek alternative measures is leading to a breakdown in the system and ends up costing the Army more money. The units get special repair authority (SRA) to contract repairs done normally by the wholesale level. "These repairs can be done cheaper, so we have the growth of 'Cottage Industries' (CI) at the unit level." [Ref. 23] The problem exists when one considers the amount of units that could have a CI established. There are several bases, including Army National Guard and Reserve units, here in the United States as well as overseas. The Army would be paying an exorbitant amount of money for redundancy in maintenance costs, even though they would pay less than the current wholesale system. A PVS sustainment concept achieves the same, or possibly higher cost savings without the loss of data or deployment sustainability. Another problem occurs when units deploy as the CI will not deploy with them. Because of the maintenance conducted within the CI, the Army may not have any data on trends or failures. In addition, depot maintenance capability will be reduced with the lack of workload. The supply and maintenance system will not be prepared for the demands that will occur during the deployments and Apache sustainment will be jeopardized.

3. Readiness Implications

The Apache readiness is expected to improve throughout the fleet with the adoption of PVS. For the past year (July 1999 to June 2000), the Mission Capable (MC) status for the Apache fleet world wide was 56.3% (versus the Army's standard of 75%), and the Fully Mission Capable (FMC) rate for the same time period was 51% (versus the Army's standard of 70%). [Ref. 30] Factored in these rates is approximately three months when the fleet was grounded due to an ASAM (Aviation Safety Action Message). Factoring out the three months of grounding, the average MC rate was 65.3% and the FMC rate was 59.4%. [Ref. 30] According to Mr. Al Hopkins, Chief Support Branch, PM Apache, a reduction based upon percentage was not the metric to gauge the success of PVS on readiness. The readiness was based upon the projected increase of parts availability and reduction in wait time for parts to arrive from time of order. The waterfall affect would be an increase in FMC and MC rates and a reduction of NMCS (Non-Mission Capable Supply, aircraft is down and awaiting parts) and NMCM (Non-Mission Capable Maintenance, parts are available and awaiting maintenance action) rates. The unknown factor that made a percentage increase estimate impossible was the utilization of the maintenance personnel. Mr. Hopkins elaborated upon this topic of personnel utilization. The estimate of actual maintenance time spent on the aircraft is four hours per week. The other time is spent doing other tasks or duties not specifically working on the aircraft. The theory is that if more parts are available, then more time could be spent on the aircraft maintenance actions, thus increasing the FMC and MC rates and reducing the NMCM rates.

C. NAVY H-60 SERIES HELICOPTERS

1. Performance Based Logistics

The Navy's proposed PBL was initially intended to replicate the Apache PVS, but after observing the problems that the Apache community had in getting approval of the PVS and compiling lessons learned, the Navy modified their PBL to fit their needs. Through this modification, the Navy is within six months of signing a contract. If the Apache PM adopted the PBL strategy, PVS would have fewer challenges and could be closer to contract award.

2. PVS Versus PBL

Where PVS strives for a "nose-to-tail" support, the Navy utilizes a phased approach. The Army could proceed in a phased approach as the Navy, by focusing primarily upon Apache peculiar items, repairables, consumables, and support equipment. The contractor is also responsible for the storage, packaging, shipping, and handling of those peculiar items. The contractor also has configuration management and reliability improvements for the Apache peculiar items.

The phased approach allows the contractor to run the system as PVS, and it facilitates the ability for the Army to observe and verify the system works. Any problems identified throughout the system could be adjusted before the following phases begin.

Where PVS proposes to perform all levels of service and support initially, PBL proposes six follow-on phases. PVS could mirror the PBL phases because the supportability is virtually similar. Phase II is engine contractor logistics support (CLS). Phase III deals with partial CLS, the organizational (O) level and some of the intermediate (I) level is not included, and Phase III is divided into three sections. Phase IIIA is an organic/commercial partnership, depot level repair. Phase IIIB is the

contractor engineering technical support. Phase IIIC deals with publications. The publications include interactive electronic technical manuals. The final projected phase (Phase IV) deals with training and the support of the trainers. The phases and their application are Branch and aircraft non-specific.

Where PVS is trying to remove itself from the AWCF, NAVICP projects to keep the program under the NWCF. The AWCF is the greatest challenge to the implementation of the Apache. If PVS could remain "under" the AWCF, less conflict would occur from those proponents of the AWCF. A foreseeable problem is that by remaining under the AWCF, no real change in the dollars spent occurs. The units will still pay the same amount for parts as they are currently. The other problem is the ability to incentivize TAS. Since the money received from the surcharge goes directly into the WCF, a higher price would have to be paid by the units to provide a profit to TAS.

The most significant advantage is the funding for the program is from the Navy Working Capital Fund (NWCF). This planned funding is significant, because PVS has encountered significant resistance from proponents of the AWCF and it is in jeopardy of complete cancellation. By working within the system and in an incremental or phased method, organizations that would otherwise be reticent to change are more accepting of the PBL plan. The funding channels will not change; therefore the overhead surcharges will still be paid into the NWCF. Utilizing the incremental method allows NAVICP to closely monitor the effectiveness of each new phase. Problems can be identified early and corrected with the implementation of each phase.

D. SUMMARY

Several benefits have been outlined in the analysis. The Apache PVS is an aggressive initiative that has excellent potential to save the Army upwards of \$1.5 billion over five years. PVS will improve the readiness, sustainability, and provide a method to modernize a legacy system. The benefits of PVS far exceed the current maintenance and supply system.

The Navy's PBL system is similar to the PVS with the exceptions of its implementation schedule and funding. By obtaining the lessons learned from PVS, NAVICP has succeeded towards contract award where PVS continues to struggle.

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V. CONCLUSIONS AND RECOMMENDATIONS

“PVS provides a new paradigm in acquisition improvement and has great opportunities for cost savings and self-sustaining modernization through spares if the system contractor retains system performance responsibility.” [Ref. 8]

A. CONCLUSIONS

Through the presentation of Apache PVS, and its subsequent analysis, PVS proves to be an important step towards improving the Apache and its overall support. The primary benefits that can be realized with the PVS contract are “significant reductions in O&S costs, improved parts availability, potential for improvement in aircraft readiness, and sustainment funding freed for reinvestment in modernization.” [Ref. 23]

PVS is an aggressive proposal that has great potential to manage the LCC of the Apache. It is aggressive in that it will change the flow of dollars that currently generates upwards of \$60 million annually towards the AWCF for non-Apache systems, to one that places money directly into the maintenance and upgrades to the Apache. As presented earlier, the Army wholesale supply costs for the Apache are estimated to be \$400 million per year. “PVS will provide this scope of work with performance guarantees for approximately 16% less in the first five years, and with greater savings committed in the contract for following years.” [Ref. 6] This equals to approximately \$320 million in savings over the initial five years.

Some additional areas where PVS will provide additional benefits without added costs are as follows [Ref. 6 and 17]:

- 20% of contract funds would be dedicated to improving system reliability, or

equipment modernization, by utilizing maintenance through spares (MTS)

- Guaranteed supply availability
- Firm-fixed-price lifetime warranty/performance guarantees
- Best manufacturing and acquisition practices
- In times of deployment, full support is guaranteed
- Part obsolescence responsibility
- 25% reduction in spares and repair costs
- 25% reduction in inventory investment
- 20% reduction in Depot level returns
- Average parts and supplies requisition fills at the unit level for routine

requests at 90% within 5 days and aircraft-on-the-ground (AOG) at 95% fill within 24-48 hours both in the United States and overseas.

TAS guarantees all of these areas and with no additional funding. This is a significant advantage over the current system.

PVS replaces a system that currently reacts to problems with one that is proactive in the prevention of problems. The current logistics supply system, with its two-tiered management structure, does not provide oversight of the parts or the increase in reliability in the parts. PVS combines the two tiers into one that is concerned with increased performance and improved parts reliability.

Under the current logistics system, the contractor makes no additional money if parts reliability is increased and may actually lose money through reliability improvements. This incentivizes them to just sell parts to the Army. PVS provides the contractor "the incentive to improve service, lower our costs, improve reliability, and

allow them to make a profit.” [Ref. 6]

With the FFP contract, any money saved through product improvement or performance improvement translates to profit for the contractor. With PVS, the contractor has the authority and responsibility to make reliability improvements as necessary to reduce costs.

The ability of the PVS to improve the aircraft through spares is vital to the success of the future system. The maintenance problems mentioned are increasing in frequency and severity. The age of the fleet is taking its toll on the sustainability and reliability of the aircraft.

B. RECOMMENDATIONS

Implement the Apache PVS contract. The Army must work towards compliance with Congress’ direction under Section 912 of the National Defense Authorization Act for FY 1998, Section 816 of the National Defense Authorization Act for FY 1999. The direction is towards streamlining the acquisition organizations, workforce, and infrastructure. PVS was identified, by name, as one of the initiatives that must be undertaken to meet the given directives.

According to MG Snider, PVS is “dead” in its current form [Ref. 21]. For it to be revived, changes must occur in the writing of PVS and the way of thinking at the higher levels of DOD.

The challenge is how do we implement any of these innovative solutions (PVS). This is very troubling but even more troubling is the ineffective or lack of mechanism within DoD for evaluating and implementing innovative proposed solutions. Inherent in this lack of clearly defined, streamlined decision mechanism is an apparent unwillingness to make the necessary changes to the military financial system, even to evaluate a pilot program.

Apache PVS, with its guaranteed cost savings and performance and

readiness benefits to the soldier, has been delayed. Millions of dollars in savings have already been lost and critical needed modernizations efforts such as TADS/NVS Reliability improvements and second generation FLIR delayed. The question facing us today is "Is there a real commitment to reform or are we mired in the bureaucracy of "Business as Usual"? Clearly the need to reform is far ahead of either our willingness or ability to reform. [Ref. 23]

In a memorandum dated August 10, 2000, The Under Secretary of Defense, Mr. Jacques Gansler has requested PVS be reevaluated for implementation. He reiterated the statement that "There is widespread agreement that PVS will provide tremendous benefits to the operational users in terms of readiness and performance- - as well as saving money." He wants the PVS full implementation to begin in FY 2002.

In a time of trying to do more with less, and the DoD budget shrinking annually, the Army should pursue better and more efficient means of allocating its funds. The PEO Aviation should continue to advocate the implementation of the PVS program initiative. The Army should streamline the AWCF to make it more competitive with outsource contractors. The Army should continue to work with industry through best practices to determine improved methods of supporting its major systems.

The \$1 billion worth of Apache inventory should be decapitalized. Over a billion dollars worth of inventory is already decapitalized annually. The AWCF preservation rationale; "because of the long-term implications for other systems to leave the AWCF" is not valid if other more lucrative opportunities exist, such as PVS.

If PM Apache is unable to initiate the PVS due to the AWCF issue, the Navy's PBL solution could be applied to PVS. The Army should investigate an incremental step method that may reduce AWCF impacts.

The modernization of the fleet is imperative for the Apache pilots' ability to conduct missions and survive on the future battlefields around the world. This can be accomplished through the approval of the Prime Vendor Support system and the resulting P³I funding.

B. AREAS FOR FURTHER RESEARCH

1. Army Working Capital Fund

Research the viability of the AWCF on the major Army programs. Is it advantageous to maintain it when new initiatives are introduced to save money and improve systems? Compare the advantages and disadvantages of the AWCF with possible initiatives balanced against USC Title X requirements.

2. Case Study of a PVS System on Other Army Aircraft

If PVS is adopted as recommended, what other aircraft could a PVS initiative prove beneficial? Propose a study for a legacy system that might benefit from a PVS system (i.e., CH-47 Chinook or UH-60 Blackhawk).

3. An in-depth Evaluation of the Navy's PBL

Once the Navy's PBL contract is signed, conduct an in-depth analysis of the system and how it avoided problems in its implementation. Propose an in-depth analysis of any other Navy aircraft that could benefit from a PBL system.

4. A case study after PVS is accepted

Once the PVS contract is signed and work has begun on the system, perform an analysis on the successes or shortfalls of the system. Compare current projections of initiatives with actual calculations. Is the program as beneficial as anticipated?

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